

## FLORISTIC CHANGES WITHIN PITCHER PLANT HABITATS IN GEORGIA<sup>1</sup>

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About the turn of this century Harper (1906) recognized that nearly one-fourth of the flora within the Altamaha Grit Region consisted of species characteristic of the moist pine barrens. These lowland habitats were mostly occupied by cypress (*Taxodium ascendens*), pines (*Pinus elliottii*) and *P. serotina*) and mixed shrubs along with many insectivorous plants, particularly, *Sarracenia*, *Drosera*, *Pinguicula*, and *Utricularia*.

This study indicates some of the floristic changes that have occurred in the moist barrens within the past fifty years by comparing the list of 1906 with that made in 1962. Furthermore, some suggestions are offered that may explain observed differences in these lists.

Early soil survey reports (Sweet and Tillman, 1918; Moon, 1928) indicated that pitcher plant habitats were of rather low quality and that they were best used as forests or as unimproved pastures. Later reports (Phillips, *et al.*, 1928; Beesley, 1948) point out that many of these lands could be improved for agricultural purposes by clearing the trees and undergrowth, and by draining the excess water. Modern land management has greatly altered habitats in that many have been cleared, drained and burned annually for intensified grazing on native grasses. Nevertheless, these habitats remain without applications of inorganic fertilizers. Other habitats remain apparently undisturbed for intervals of ten to twenty years, altered only by fire, selective logging, or the collection of pine sap for turpentine.

### Places and Procedures

Specimens of plants in flower were collected monthly between April 21, 1962, and October 7, 1962, at seven moist

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pine barrens throughout the Middle Coastal Plain region. Many non-flowering plants were collected also. Specimens are on file in the University of Georgia herbarium. Collection sites were located in:

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|-----------------|---|
| Emanuel County. | 1.5 mi. s. Oak Park on w. side of U. S. highway 1. Plummer soil series.                       |
| Toombs County.  | 3 mi. e. of railroad depot in Lyons. Plummer soil series.                                     |
| Toombs County.  | 2.5 mi. n. of court house in Lyons. Myatt soil series.  |
| Wheeler County. | 2 mi. w. of Alamo on Ga. highway 30. Plummer soil series.                                     |
| Irwin County.   | Intersection of Irwin and Ben Hill counties at U. S. highway 129. Plummer soil series.        |
| Tift County.    | 2.5 miles w. Alapaha River that intersects with Tift and Berrien counties. Rains soil series. |
| Bullock County. | 4 mi. s. Statesboro on w. side Ga. highway 67. Plummer soil series.                           |

All soils are loamy fine sands and for practical purposes the differences between the series are chiefly morphogenetical (Plummer, 1963).

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#### Results and Discussion

Harper reported 187 species in the moist pine barrens, and estimated the list to be about 75 per cent of the total flora. The list included three species of trees, 21 shrubs, and 163 herbaceous plants.

During 1962 we collected 102 of these species, exclusive of the Cyperaceae and Juncaceae, plus 98 species in addition to those listed by Harper (Table 1).

If Harper's values are used to estimate an absolute number of species, and these values are applied to our findings at the 75 per cent level, then we found at least a 33 per cent increase in the number of species since 1906.

Coincidentally, the habitats with the greatest numbers of species were those where grazing was most intense. The vegetation in these areas was closely cropped as opposed to the bulky undecomposed litter found on the ungrazed areas. Annual burning has been an important factor in removing litter and releasing nutrients. Thus, fire has provided optimum conditions for the most heliophytic species. Essentially then, fires and pastures have made new habitats with new ecological niches and the species list would expectably be greater. The large number of immigrant species in the moist pine barrens may be related also to the introduction of pioneers through regular supplemental feeding of cattle during winter with hay from various origins. Furthermore, vehicular traffic from logging operations, bulldozers and highways has increased. Railroads pass most of the moist pine barrens and plants may be introduced via these routes.

The Gramineae with twenty-two new introductions had the greatest increase in number of new introductions, and the majority of these came from two heavily grazed areas. The Compositae with eighteen introductions were rather evenly distributed among the collection areas. Most of the remaining new introductions came from all seven areas.

Harper did not include *Sphagnum* spp., but several unidentified species of sphagnum moss were collected in 1962 from five of the seven areas. *Ranunculus laxicaulis*, *Polygonum hydropiperoides*, and *Euphorbia corollata* now fill certain gaps in systematics that occurred in Harper's report.

We failed to find fifty (Table 2) of the species reported by Harper. Probable reasons are: (1) the abundance rating Harper gave to almost half of these had a low index-value; that is, they were uncommon or inconspicuous, (2) our collections did not include the pine barrens in southwestern Georgia as did some of Harper's observations, and (3) our collections were from semi-agrarian land, whereas Harper probably observed more undisturbed habitats.

Modern botany places very little significance on flower color as a classification scheme, nevertheless, in habitats where aluminum ions are important enough to either fringe

the area of toxicity (Plummer 1963) or affect flower coloration as may be the case in these habitats, then Harper's observations may justifiably be paralleled. A predominance of white, purple and yellow flowers occurred early in this century, and these colors prevail today. On the basis of relative percentages of numbers of species, the abundance of white-flowered species decreased fourteen percent, the yellow-colored species increased eleven percent, and the percentage of purple-flowered plants remains unchanged. The number of red-flowered species increased from five to six. Of the 98 new introductions, about one-third had white or cream-colored flowers, another third had yellow flowers, about 20 percent had purple or blue flowers and the remainder of the species were mostly grasses, sedges or rushes.

*Sarracenia* species in the moist pine barrens associate with *Sporobolus teretifolius* Harper. Certain evidence (Roberts and Oosting, 1958; Plummer, 1963) suggests that *Aristida stricta* occurs on the very wet sites. *Aristida stricta* in vegetative condition may easily be confused with *Sporobolus teretifolius*, but *Aristida* occurred most abundantly in the driest parts of the areas used in this study. As the water table in the moist pine barrens is lowered by agricultural practices and by roadside drainage ditches, *Aristida* has moved to within 20 feet of *Sarracenia flava* in at least one area and it may be closer in other moist pine barrens. *Aristida stricta* is omitted in this report as a member of the flora of the moist pine barrens.

### Summary

The flora of the moist pine barrens has changed within the last fifty to sixty years with the introduction of about 98 new occurrences and the elimination of perhaps fifty species. The floristic changes probably result from recent changes in land utilization. Coincident with intensified grazing the new introductions are associated with: (1) regulated burning that has been commonly practiced, (2) the import of new species through winter supplements of hay for cattle, and (3) increased vehicular traffic in the vicinity of the habitats.

TABLE 1

New occurrences in the moist pine barrens<sup>1</sup><sup>1</sup>Genera listed according to Small (1933).

## TREES

<i>Pinus palustris</i> Mill.	<i>Liriodendron tulipifera</i> L.
<i>P. taeda</i> L.	<i>Acer rubrum</i> L.

## SHRUBS AND VINES

<i>Smilax laurifolia</i> L.	<i>A. hypericoides</i> L.
<i>Rubus betulifolius</i> Small	<i>Rhododendron serrulatum</i> (Small) Millais
<i>Ilex myrtifolia</i> Walt.	<i>Vaccinium tenellum</i> Ait.
<i>Ceanothus microphylla</i> Michx.	<i>Viburnum cassinoides</i> L.
<i>Ascyrum pumilum</i> Michx.	

## FORBS

<i>Sagittaria graminea</i> Michx.	<i>S. foliosa</i> Fern.
<i>Lachnocaulon glabrum</i> Koern.	<i>Asclepias stenophylla</i> Gray
<i>Mayaca fluviatilis</i> Aubl.	<i>Phlox pilosa</i> L.
<i>Xyris ambigua</i> Beyr.	<i>Verbena bonarensis</i> L.
<i>X. torta</i> J. E. Sm.	<i>Scutellaria integrifolia</i> L.
<i>Hypoxis hirsuta</i> (L.) Coville	<i>Koellia flexuosa</i> (Walt.) Mac M.
<i>H. juncea</i> J. E. Smith	<i>Gratiola neglecta</i> Torrey
<i>H. sp.</i>	<i>G. ramosa</i> Walt.
<i>Gyrotheca tinctoria</i> (Walt.) Salisb.	<i>Ilysanthes monticola</i> (Nutt.) Raf.
<i>Spiranthes vernalis</i> Engelm. & Gray	<i>Linaria canadensis</i> (L.) Dum.
<i>Polygonum hydropiperoides</i> Michx.	<i>Gerardia fasciculata</i> Ell.
<i>Phytolacca americana</i> L.	<i>Buchnera floridana</i> Gandoger
<i>Ranunculus laxicaulis</i> (T. & G.) Darby	<i>Ruellia oblongifolia</i> Michx.
<i>Drosera brevifolia</i> Pursh	<i>Utricularia fibrosa</i> Walt.
<i>Cassia nictitans</i> L.	<i>U. virgatula</i> Barnh.
<i>Geranium carolinianum</i> L.	<i>Plantago virginica</i> L.
<i>Oxalis filipes</i> Small	<i>Houstonia caerulea</i> L.
<i>Euphorbia corollata</i> L.	<i>Diodia tetragona</i> Walt.
<i>Piriqueta caroliniana</i> (Walt.) Urban	<i>D. virginiana</i> L.
<i>Viola lanceolata</i> L.	<i>Lobelia nuttallii</i> Roem. & Schult.
<i>V. affinis</i> Leconte	<i>Vernonia noveboracensis</i> (L.) Michx.
<i>Centella erecta</i> (L. f.) Fern.	<i>Eupatorium capillifolium</i> (Lam.) Small
<i>Ptilimnium capillaceum</i> (Michx.) Raf.	<i>E. leucolepis</i> T. & G.
<i>Gelsemium rankinii</i> Small	<i>E. anomalum</i> Nash.
<i>Sabbatia paniculata</i> (Michx.) Pursh	<i>Trilisa odoratissima</i> (Walt.) Cass.
	<i>Solidago microcephala</i> (Greene) Bush
	<i>S. stricta</i> Ait.

Pluchea foetida (L.) DC.  
 Erigeron strigosus Muhl.  
 Conyza canadensis (L.) Cron.  
 Gnaphalium peregrinum Fern.  
 Rudbeckia glabra DC.  
 R. serecea T. V. Moore

Helianthus tuberosus L.  
 Helenium tenuifolium Nutt.  
 H. brevifolium (Nutt.) A. Gray  
 H. vernale Walt.  
 Pyrrhopappus carolinianus  
 (Walt.) DC.

## GRASSES

Erianthus coarctatus Fern.  
 E. giganteus (Walt.) Muhl.  
 Andropogon perangustatus Nash  
 A. stolonifer (Nash) A. Hitchc.  
 Axonopus affinis Chase  
 Paspalum longipilum Nash  
 P. setaceum Michx.  
 P. urvillei Stevd.  
 Panicum albomarginatum Nash  
 P. longiligulatum Nash  
 P. scabriusculum Ell.  
 P. lancearium Trin.

P. leucothrix Nash  
 P. anceps Michx.  
 P. condensum Nash  
 P. consanguineum Kunth  
 P. ensifolium Baldw.  
 ex. Ell.  
 P. scoparium Lam.  
 P. trifolium Nash  
 P. virgatum L.  
 Setaria geniculata (Lam.) Beauv.  
 Agrostis scabra Willd.

## TABLE 2

Species occurring in 1906 but not observed in 1962<sup>1</sup>

<sup>1</sup>Species list according to Harper (1906).

## TREES

Pinus serotina

Liquidambar styraciflua

## SHRUBS AND VINES

Itea virginica  
 Cliftonia monophylla  
 Pieris phillyreifolia

Xolisma sp.  
 Styrax pulverulenta

## FORBS

Sagittaria mohrii  
 Mayaca aubletii  
 Xyris fimbriata  
 X. neglecta  
 X. platylepis  
 Syngonanthus flavidulus  
 Eriocaulon lineare  
 Melanthium virginicum  
 Oxytris crocea  
 Aletris lutea  
 Drosera filiformis  
 Sarracenia rubra  
 Rhexia filiformis

R. stricta  
 Eryngium yuccifolium  
 Centella repanda  
 Sabbatia lanceolata  
 Physostegia denticulata  
 Koellia hyssopifolia  
 Sophronanthe pilosa  
 Gerardia pauperula  
 G. skinneriana  
 Utricularia macrorhyncha  
 U. subulata  
 Eupatorium verbenaefolium  
 Carphophorus pseudo-liatris

Aster eryngiifolius  
 Rudbeckia mohrii  
 R. nitida  
 Helianthus undulatus  
 Coreopsis angustifolia

Baldwina atropurpurea  
 B. uniflora  
 Leptopoda helenium  
 Carduus lecontei

## GRASSES

Andropogon tracyi  
 Paspalum curtisianum  
 Panicum combsii

P. hemitomom  
 P. melicarium  
 Arundinaria tecta

## FERNS

Anchistea virginica

## CLUB-MOSSES

Lycopodium pinnatum

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